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Title of Invention (*Short and Descriptive*)
Improved die attach method

WHERE & WHEN RECEIVED (*TIME STAMP*)

9 MAY 99 8:7

---LE IPLAW---

Problem Solved By This Invention (*Summary*)
Allows for greater control of die attach adhesive

NOTE:
For clearance of products by the Intellectual Property Law Department, it is imperative that the respective attorney be made aware of any product associated with this invention disclosure and the announce/release date.

(1) If this invention is slated for incorporation into a SPECIFIC product,
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Invention Background

To meet the increasing demands on inkjet print quality, the packaging technology must provide better thermal mangement, more efficient use of space, and precision alignment of ejector nozzles. For thermal management, the die attach adhesive plays a key role. The bond line must be controled in every dimension. Both the placement, in relation to the substrate and via, and the thickness of the bondline are important. As we try to incorporate more devices on each chip, more chips on each head, and all in a smaller package, there is less room for making the necessary ink seals.

Current packages have a Silicon chip that contains a plurality of heating devices. These chips have either a single via (Fig. 1) or multiple vias (Fig. 2) which supply ink from the back side to the front side of the chip where the heating devices are located. A line of die attach adhesive is dispensed on a substrate which must

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Signature of Witness Date: Jeanne Marie Baldwin 5/17/99	Inventor's Signature / Date: C. E. Sullivan 5-14-99	Inventor's Signature / Date: Kent Ubellacker 5/14/99
Signature of Witness Date: Gary R. Williams 5/18/99	Inventor's Signature / Date: Paul Timothy Spivey 5.14.99	Inventor's Signature / Date

seal around and between each via. There currently are no features on the backside of the chips to control the die attach adhesive flow during placement and cure.

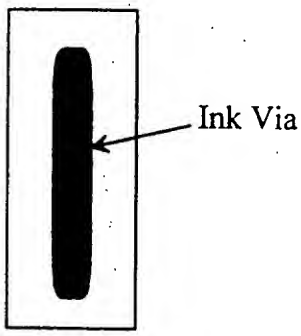

Fig. 1

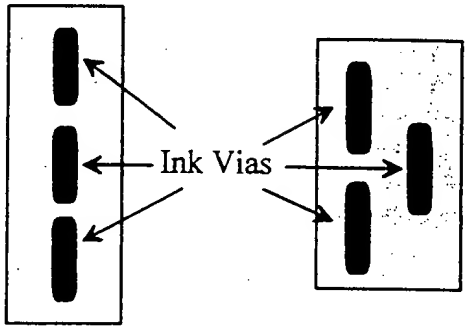

Fig. 2

Invention Description

This disclosure covers placing a trench on the back side of the Silicon chip to control the die attach adhesive. In the case of a chip with a single via, this trench would encircle the via . (Fig 3.) This pattern could be created through current micromachining techniques or by laser ablation with, for example, a YAG Laser.

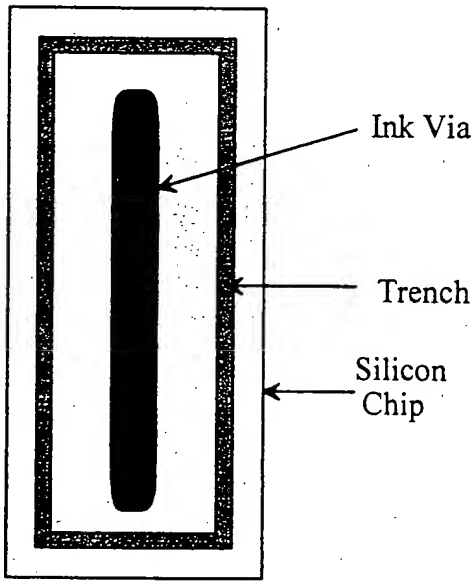

Fig. 3

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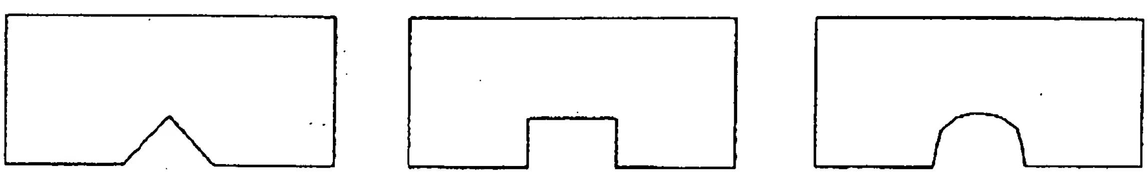
Signature of Witness Date Jean Marie Baldock 5/17/99	Inventor's Signature Date M E Sullivan 5-14-99	Inventor's Signature Date 5/14/99
Signature of Witness Date Gary R. Williams 5/18/99	Inventor's Signature 5-14-99 Date Paul Timothy Spivey	Inventor's Signature Date

Another embodiment of this invention would have the trench extending to the outside edge of the chip in each corner.(Fig. 4) This would also provide vents for the die attach adhesive to outgas during cure. This pattern could also be created through current micromachining techniques, or by laser ablation with a YAG Laser, as well as by dicing with a dicing saw.

Fig. 4

Figure 5 shows a cross sectional profile of each of the above mentioned methods of cutting into a Silicon chip.



Micromachining Dicing YAG Laser

Fig. 5

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Signature of Witness Date Gary R. Williams 5/18/99	Inventor's Signature 5-14-99 Date Paul Timothy Spivey	Inventor's Signature Date

In the current method the die attach adhesive is dispensed onto a substrate and the chip is brought into contact with the adhesive. The adhesive is forced to flow laterally as the chip is lowered into place (Fig. 6) which can yield a very wide bond line in the X direction as the hieght of the bond line in the Z direction is decreased.

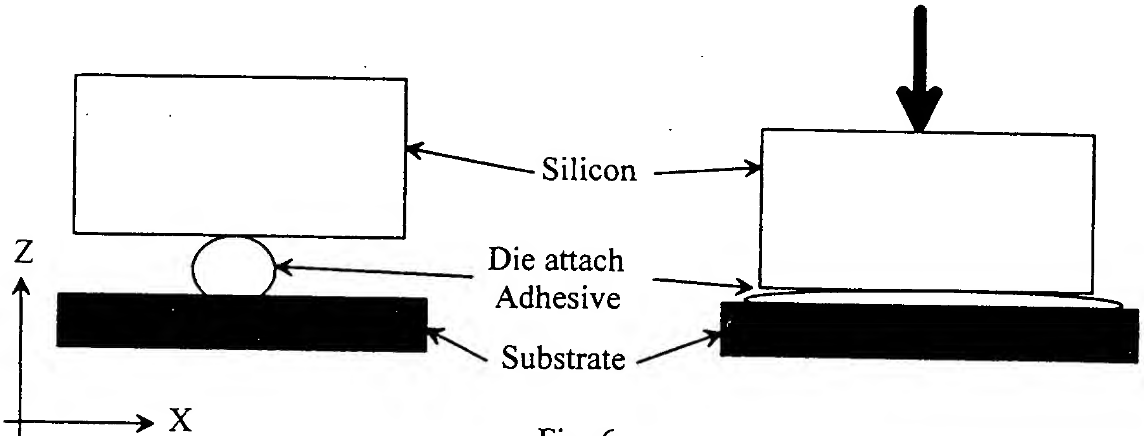

Fig. 6

Placing trenches on the backside of the Silicon chip would allow for control over where the die attach adhesive is allowed to flow and could even be contained within the trench which provides a very accurate and precise bond line. For a set amount of adhesive the height of the bond line in the Z direction and the width of the bondline in the X direction would be greatly decreased. A trench also provides a greater surface area to bond to over a given X distance on the chip.

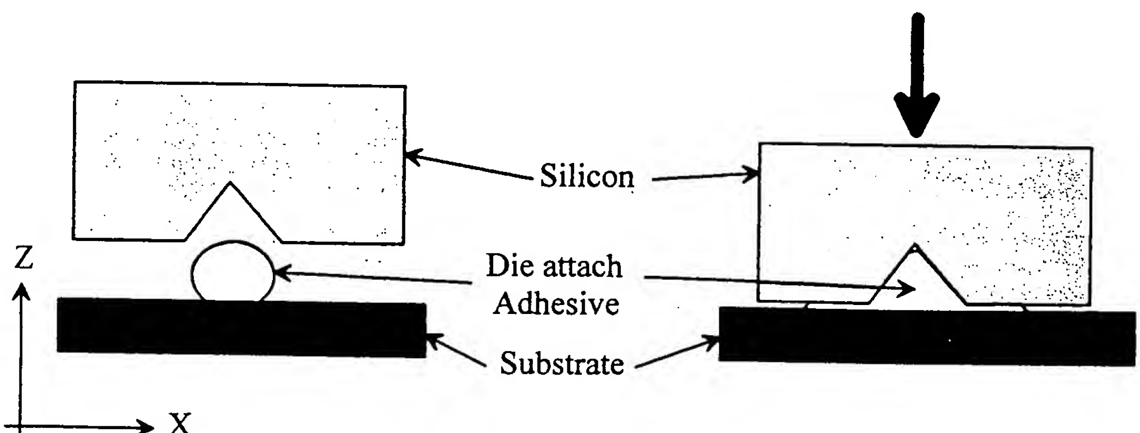

Fig. 7

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A precise bond line becomes important for applications which require multiple ink vias. Sealing between ink vias is crucial to prevent cross contamination between different colored inks. (Fig. 8)

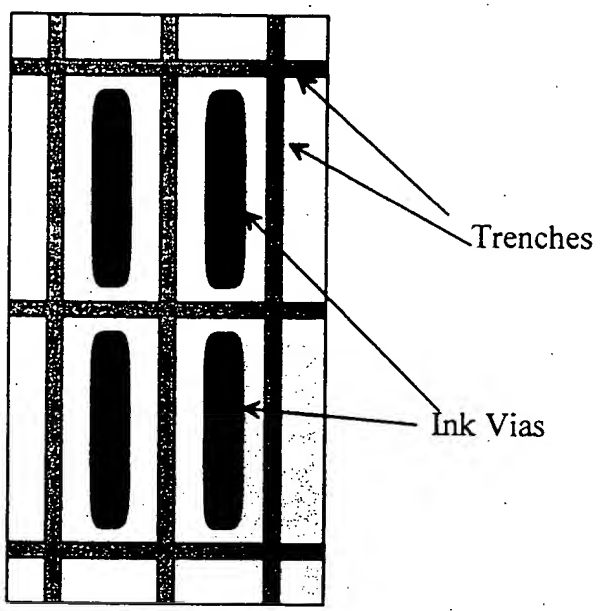

Fig. 8

As print speeds increase the delivery rate of ink to the heaters must also increase which requires wider ink vias. This in turn means less area on the chip to seal between multiple ink vias. Trenches would improve the integrity of the bond lines in small areas such as between multiple ink vias on a given chip. (Fig 9.)

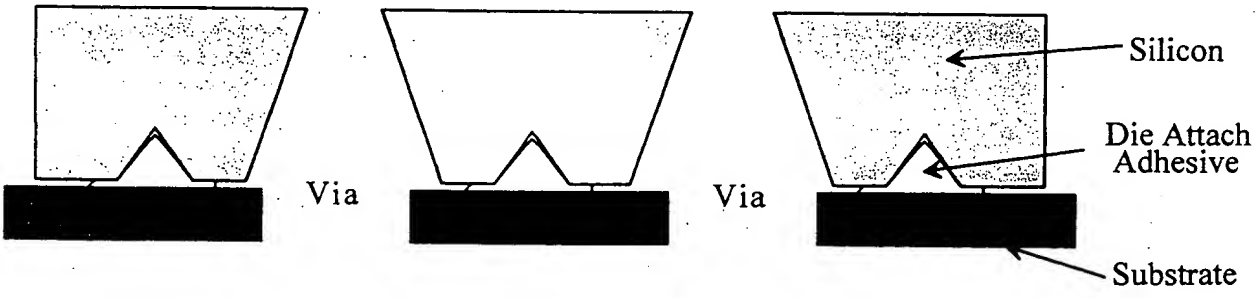

Fig. 9

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